# LONGITUDINAL GUIDING ELEMENT FOR MOTOR VEHICLE SEAT

## Description

The invention relates to a longitudinal guiding element for a motor vehicle seat according to the preamble of patent claim 1.

A longitudinal guiding element for a seat of this kind comprises two guide elements extending in the longitudinal direction of the rail, and a guiding device by means of which the one guide element can be displaced relative to the other guide element in the longitudinal direction of the rail. By providing one of these two guide elements to hold an upholstery carrier of a motor vehicle seat and connecting the other guide element to the body floor of the motor vehicle it is possible to adjust the position of the corresponding motor vehicle seat in the seat longitudinal direction by moving the one guide element relative to the other guide element. By seat longitudinal direction is thereby meant that direction along which extend the thighs of a vehicle occupant sitting in the normal seated position on the corresponding vehicle seat.

The said guiding device has two sliding guides mounted one behind the other in the seat longitudinal direction which are each formed by a guiding slide and a guiding pin

guided in the relevant sliding guide. When the one guide element is displaced relative to the other guide element in the seat longitudinal direction there follows a relative movement of the guiding pin in the associated guiding slide. This relative movement takes place independently of whether the guiding slide or the guiding pin is mounted on the guide part which is fixed on the body. In each case one of these two functional groups is mounted on the guide element which is fixed on the body and the other is mounted on the longitudinally displaceable guide element.

With this type of longitudinal guiding element for a seat there is the problem that in the case of a small distance – compared to the overall length of the relevant guide element – between the two guide pins in the seat longitudinal direction there is the risk of damage to the arrangement in the event of stronger loads on the vehicle seat with corresponding torque.

The object of the invention is therefore to provide a longitudinal guiding element for a seat of the type mentioned at the beginning which is characterised by increased stability in respect of torque stresses.

This object is achieved according to the invention in that the first sliding guide is formed by a guiding slide provided on the one rail and by a guiding pin provided on the other rail whilst the second sliding guide is formed by a guiding pin provided on the one rail and by a guiding slide provided on the other rail.

Expressed in other words, a guiding slide of the first sliding guide and a guiding pin of the second sliding guide are mounted on one rail one behind the other, seen in the longitudinal direction of the seat, whilst a guiding pin of the first sliding guide and a guiding slide of the second sliding guide are mounted one behind the other on the other rail. It is hereby achieved that the distance between the two guiding pins changes when the two guide elements are displaced relative to each other in the seat longitudinal direction. This enables in turn a design of the guiding device overall such that in those longitudinal positions of the seat where a particular stability is required in respect of external torques a particularly wide distance can be provided between the two guiding pins in the seat longitudinal direction.

If the corresponding vehicle seat is a rear seat in the second or third row of seats in a vehicle where a displacement in the seat longitudinal direction always occurs to make it easier for passengers to get into the vehicle or if additional cargo space is to be provided in the boot of the vehicle then a particular stability is required for the arrangement when the guide elements are in a relative position in which the corresponding vehicle seat is set up for receiving a vehicle passenger. If the guide elements are however in a relative position only to allow easy entry into the vehicle or to provide additional cargo space then clearly the stability requirements for the arrangement are lower. The guiding slides and guiding pins are therefore to be arranged so that in the first mentioned case there is a particularly wide distance between the guiding pins in the seat longitudinal direction.

If for example the two guide elements are displaceable relative to each other in the rail longitudinal direction between a first and a second end position whereby the one end position corresponds to a position in which the corresponding vehicle seat is to serve to receive a vehicle occupant and the other end position corresponds to a position in which entry into the vehicle is to be made easier and/or additional cargo space is to be provided, and if these two end positions can be adjusted in that the two guiding slides of the guiding device each extend between a front stop in the seat longitudinal direction and a rear stop in the seat longitudinal direction which limit the movement of the relevant guiding pin in the guiding slide then preferably in the one end position of the two guide elements the guiding pin of the sliding guide at the front in the rail longitudinal guide bears against the front stop of the associated guiding slide whilst the guiding pin of the rear sliding guide in the rail longitudinal direction bears against the rear stop of the guiding slide. In this end position the widest possible distance is set between the two guiding pins which ensures a correspondingly strong stability. This end position of the guide elements consequently corresponds to a seat longitudinal position in which the corresponding vehicle seat serves to receive a vehicle occupant.

In the other end position of the two guide elements however the guiding pin of the front sliding guide in the rail longitudinal direction bears against its rear stop whilst the guiding pin of the rear sliding guide in the rail longitudinal direction bears against

the front stop. This corresponds to the smallest possible distance between the two guiding pins so that here there is a lower stability in respect of torque stresses. In this end position of the two guide elements the vehicle seat is thereby preferably only set up to provide an enlarged cargo space or the like.

The two guide elements are preferably formed as seat side parts which are arranged horizontally side by side across the longitudinal direction of the seat and thereby form an inner and outer guide element whereby preferably the outer guide element is to be mounted fixed on the body and the inner guide element serves to receive the upholstery carrier. The said guide elements are preferably arranged in pairs on the two outer longitudinal sides of a motor vehicle seat.

In order to lock the longitudinal guiding element of the seat in its two end positions a locking device is provided which can be released by means of an unlocking lever in order to execute a longitudinal adjustment of the seat.

For a defined guide of the guiding pins in the associated sliding guides the guiding pins are supported in the relevant sliding guide on the one side along the vertical axis perpendicular to the seat longitudinal direction and on the other side along a first horizontal direction (horizontal cross direction) perpendicular to the seat longitudinal direction. The latter is thereby possible in that the guiding pins each engage through the relevant sliding guide and bear with a widened end section against the edge of the associated sliding guide. On the other hand the two guide elements can be supported against one another along the opposite horizontal direction.

In order to enable the described support of the individual elements of the guiding device against one another corresponding sliding areas are formed on the guiding slides.

According to a preferred embodiment of the invention the sliding areas are formed by a separate slider preferably made of plastics which is fixed on the relevant sliding guide. This slider preferably has two opposing slide faces to support the relevant guiding pin along the vertical axis as well as two further opposing slide faces to support the guiding pin along a first horizontal direction and to support the guide

elements against one another along the second opposite horizontal direction transversely to the seat longitudinal direction.

The sliding regions of the slider preferably extend only over a part of the extension of the relevant guiding slide in the seat longitudinal direction so that that end section of the guiding slide in which the associated guiding pin is then housed when the seat longitudinal guide is located in an end position in which the corresponding vehicle seat is provided to receive a vehicle occupant is not covered by the sliding regions of the plastics slider. In this end position the guiding pin which is preferably made of metal then directly bears against the guiding slide which is likewise preferably made of metal so that the arrangement has a corresponding stability, more particularly there is no risk of damage to the plastics slider in the event of severe stresses. For a secure positioning of the relevant guiding pin in the said end section the latter preferably has suitably shaped support faces and tapers towards the end of the guiding slide.

Further features and advantages of the invention will become apparent from the following description of an embodiment given by way of example with reference to the drawings.

They show:

Figure 1a a perspective view of a motor vehicle seat located in the useful position with a backrest and a seat trough whose seat longitudinal position can be adjusted by means of a longitudinal guiding element;

Figure 1b the motor vehicle seat of Figure 1a without a seat trough;

Figure 2 the motor vehicle seat of Figures 1a and 1b after adjustment of the seat longitudinal position;

Figure 3a an exploded view of the longitudinal guiding element for a seat from Figures 1a and 1b;

Figure 3b a perspective view of a section of the longitudinal guiding element for a seat from Figure 3a.

Figure 1a shows a motor vehicle seat which has a seat trough W to hold a seat cushion on which a vehicle occupant can sit, as well as a backrest R which serves to support the back of an occupant seated on the vehicle seat.

The seat trough W runs between two side parts 1 of the seat which each extend in the seat longitudinal direction x on the two longitudinal sides of the seat trough W. By seat longitudinal direction x is thereby meant that direction along which extend the thighs of a person sitting in the normal position on the corresponding vehicle seat. The two seat side parts 1 are connected to one another through a cross bar Q which has fixing points B for fixing the seat trough W on the cross bar Q in the region of the front end, see Figure 1b. This cross bar Q extends horizontally along a direction y perpendicular to the seat longitudinal direction x.

By the front end of the seat trough W is meant here – seen in the seat longitudinal direction x – the end of the seat trough W at a distance from the backrest R. By rear end of the seat trough W is meant that end in the region of which the backrest R protrudes upwards from the seat underframe.

The two side parts 1 further define a bearing axis S on which the seat trough W is mounted in the region of its rear end. This extends along a horizontal direction y perpendicular to the seat longitudinal direction x.

Furthermore the two seat side parts 1 extending in the seat longitudinal direction x have in the region of their rear end an upwardly protruding end section 10 which serve as a backrest support for the backrest R and to which the backrest R is connected for swivel movement. The backrest thereby extends in its useful position illustrated in Figure 1a in which it can serve to support the back of a vehicle occupant, along a vertical axis z substantially perpendicular to the seat longitudinal direction x as well as to the horizontal transverse axis y.

The two seat side parts 1 between which the seat trough W is housed are each mounted displaceable in the seat longitudinal direction x in a further outer side part 2

to be fitted fixed on the body floor, as will be explained in detail below with reference to Figure 1b.

Figure 1b shows the vehicle seat of Figure 1a without seat trough W so that it is possible to see the individual details of the guiding device by means of which the inner side parts 1 holding the seat trough W can be displaced in the seat longitudinal direction x relative to the outer side parts 2 which are to be mounted fixed on the body floor.

In Figures 1a and 1b the inner side parts 1 are thereby located relative to the outer side parts 2 in a rear position which corresponds to a useful position of the motor vehicle seat. This means in this position in which the vehicle seat can be locked by means of a locking lever 7 it is suitable to receive a vehicle occupant. By displacing the two inner side parts 1 from the position shown in Figures 1a and 1b forwards in the seat longitudinal direction x the seat trough W and the backrest R are shifted forwards in unison with the inner side parts 1. This enables additional cargo space to be provided behind the vehicle seat which is more particularly the rear seat of a motor vehicle. If the vehicle seat is a seat in the second row in a motor vehicle which has overall three rows of seats then by moving the seat trough W and backrest R forwards it becomes easier for passengers to enter the area in the third row of seats. The inner and outer side parts 1, 2 thus form guide elements which enable the seat trough W and backrest R to move in the seat longitudinal direction x. The outer side parts 2 thereby overlap the inner side parts 1 by means of a turned upper end section 21.

According to Figure 1b the guiding device by means of which the inner side parts 1 can be moved relative to the outer side parts 2 has in each pair of side parts 1, 2 two sliding guides 3,4 and 5,6 arranged in succession in the seat longitudinal direction x and each consisting of a guiding slide 3, 6 and a bolt 4, 5 guided in the relevant guiding slide 3,6. A special feature of the vehicle seat illustrated in Figure 1b thereby lies in the fact that in the case of the relevant front sliding guide 3, 4 in the seat longitudinal direction the guiding slide 3 is mounted on the inner side part 1 and the associated guiding pin in the form of a guide bolt 4 is mounted on the outer side part 2, whilst the rear sliding guides 5, 6 in the seat longitudinal direction are each formed

by a guiding slide 6 formed on the outer side part 2 and by a guide bolt 5 mounted on the inner side part 1.

This means that in the case of the rear sliding guide 5, 6 , compared with the front sliding guides 3, 4 it is possible to interchange the association between the guide bolt and guiding slide and the inner and outer seat side part. This has the result that in the useful state of the vehicle seat illustrated in Figures 1 a and 1b where the inner side parts 1 are moved relative to the outer side parts 2 into their rearmost end position the front bolts 4 each bear against the front end of the associated sliding guide 3 and in the case of the rear sliding guides 5, 6 the bolts 5 each bear against the rear end of the associated sliding guide 6. The guide bolts 4, 5 mounted on each longitudinal side of the vehicle seat one behind the other in the seat longitudinal direction x thereby have a maximum spacing A in the seat longitudinal direction x which results in improved stability in the arrangement in respect of torque stresses.

With a conventional guiding device where for example all the guide bolts are each attached to the inner side parts 1 and all the guiding slides are attached to the outer side parts 2, the guide bolts would then in the state of the vehicle seat illustrated in Figure 1b both each be at the rear end of the associated guiding slide. The distance between the guide bolts along the seat longitudinal direction x would thereby be considerably shorter.

Figure 2 shows the vehicle seat of Figures 1a and 1b after the maximum forward displacement of the inner side parts 1 in the seat longitudinal direction (together with the relevant front guiding slide 3 and the relevant rear guide bolt 5). For this, locking levers 7 have previously been unlocked by means of an unlocking rod 70 sprung in the locking device in order to enable the inner side parts 1 to move forwards relative to the outer side parts 2.

It can be seen from Figure 2 that in the forwardly adjusted state of the inner side parts 1 (and thus also of the seat trough W and the backrest R) the front guide bolts 4 each bear against the rear end of the associated guiding slide 3 and the rear guide bolts 5 each bear against the front end of the associated guiding slide 6. Compared with the useful position of the vehicle seat illustrated in Figures 1a and 1b there is here a clearly shorter distance a between the front and rear guide bolts 4, 5 in the

seat longitudinal direction x. This is however not a problem because the motor vehicle seat in the forwardly displaced seat position illustrated in Figure 2 serves not to receive a vehicle occupant but rather only to provide an enlarged stowage space behind the vehicle seat or to provide easy entry for the vehicle passenger behind the vehicle seat.

As a result the guide bolts 4, 5 move up to each other when the inner side parts 1 are shifted forwards from the useful position, and move away from each other when the inner side parts 1 are pushed back again into the useful position illustrated in Figures 1a and 1b.

In order to prevent the motor vehicle seat from being moved through misuse e.g. by a child sitting on the relevant seat, from the useful position illustrated in Figures 1a and 1b into the forwardly displaced position illustrated in Figure 2, according to a further development of the invention the unlocking lever (in the form of an unlocking rod 70) can only be accessible to a passenger when the backrest R has been folded forwards onto the seat trough W. The motor vehicle seat can in this case only then be moved forward from its useful position when the backrest R has been folded forwards onto the seat trough W to provide additional cargo space. This preferred further development of the invention is obviously only applicable in those vehicle seats where the backrest can be folded forwards in the normal way onto the seat surface.

In order to completely rule out an occupant taking his place on the vehicle seat in the forwardly displaced position shown in Figure 2 the backrest which has been folded forwards onto the seat trough can be locked in the forwardly displaced position of the seat so that it can only be unlocked and raised up again after it has moved back into its useful position (according to Figures 1a and 1b).

The construction of the relevant guiding device is shown in detailed form in Figures 3a and 3b using the example of an inner side part 1 and outer side part 2.

Each guiding device comprises a front sliding guide 3, 4 and a rear sliding guide 5, 6 whereby the front sliding guide 3, 4 consists of a guiding slide 3 formed on the inner side part 1 and of a guide bolt 4 fixed at a fixing point 24 on the outer side part 2 and

the relevant rear sliding guide 5, 6 consists of a guiding slide 6 formed on the outer side part 2 and a guide bolt 5 fixed on the inner side part 1.

The guide bolts 4, 5 have at one axial end a fixing section 41 and 51 with which they are fixed on the associated side part 2 and 1 respectively, and are provided at the other axial end each with a head 45 or 55 by which they project out of the relevant guiding slides 3 and 6. Between the fixing section 41, 51 and the relevant head 45 and 55 extends a sliding section 40, 50 designed as a connecting section and with which the relevant guide bolts 4, 5 can slide in the associated guiding slides 3 and 6.

In order to facilitate the sliding movement of the guide bolts 4, 5 in the relevant associated guiding slide 3, 6 between the front and rear ends 31, 32 and 61, 62 a slider 8, 9 made of plastics and having a circumferential fixing frame 86, 96 is inserted in each guiding slide 3, 6.

The sliding regions 80 and 90 of the relevant sliders 8, 9 respectively comprise on the one side slide faces 84, 94 opposite one another along the vertical axis z between which the guide bolts 4, 5 are guided through their slide sections 40, 50 and on which they are supported along the vertical axis z. Furthermore the sliding regions 80, 90 of the sliders 8, 9 each have a sliding face 82, 91 which point away from the relevant guiding slide 3, 6 in the direction of the relevant other side part 2, 1. Each other side part 2, 1 slides on these slide faces 82, 91 respectively as the inner side parts 1 slide along relative to the outer side parts 2.

Finally the fixing frames 86, 96 of the sliders 8, 9 each still form a slide face 85, 95 which point away from the relevant guiding slide 3, 4 in the direction of the head 45, 55 of the relevant associated guide bolt 4, 5. The guide bolts 4, 5 are hereby supported on these slide faces 85, 95 along the transverse axis y on the sliders 8, 9 each opposite the direction along which each other side part 2, 1 is supported on the slide face 82, 91 provided for this on the relevant slider 8, 9 along the horizontal transverse axis y.

It can further be seen from Figures 3a and 3b that the front guiding slide 3 tapers in the region of its front end 31 and the rear guiding slide 6 tapers in the region of its

rear end 92. Furthermore the slider 8 associated with the front guiding slide 3 in the region of its front end has no slide faces 84 for vertical support of the associated bolt 4 and the slider 9 associated with the rear guiding slide 6 has in the region of its rear end no slide face 94 serving for the vertical support of the associated guide bolt 5 since the corresponding slide faces 84, 94 each do not extend over the overall length of the associated guiding slide 3, 6.

This means that in the useful position of the vehicle seat shown in Figures 1a and 1b where the seat is provided for receiving the vehicle occupant and where the front bolt 4 bears against the front end 31 of the associated guiding slide 3 and the rear bolt bears against the rear end 62 of the associated guiding slide 6, the guide bolts 4, 5 each bear with their sliding sections 40, 50 directly against the inside wall 30 and 60 of the relevant guiding slides 3, 6. This prevents strain on the plastics sliders 8, 9 from the increased weight of a vehicle seat occupied by a passenger. The guide bolts 4, 5 each consisting of metal and the inside walls 60, 90 of the guiding slides 6, 9 likewise consisting of metal then act directly on one another.

In that the guiding slides 3, 6 each taper in their end sections not covered by the slide faces (in the region of the front end 31 of the front guiding slide 3 and in the region of the rear end 62 of the rear guiding slide 6) the smoothest possible transition without steps is provided for the guide bolts 4,5 between the sliding regions 80, 90 and the said end sections of the relevant guiding slides 3,6 .

In a further development of the arrangement illustrated in Figures 1a to 3b it can be proposed that the front and rear guiding slides 3, 6 overlap one another in the region of their facing ends 32, 61 in the useful position of the vehicle seat (see Figures 1a and 1b) in the seat longitudinal direction x. This corresponds to an enlarged extension of the guiding slides 3, 6 in the seat longitudinal direction x and sets up a larger displacement path for the side parts 1, 2 relative to each other in the seat longitudinal direction x. The risk of a collision between the guide bolts 4,5 does not arise here since in the useful position of the motor vehicle seat where the guide slides 3, 6 would overlap one another the front guide bolt 4 is mounted in the region of the front end 31 of the front guiding slide 3 and the rear guide bolt 5 is mounted in the region of the rear end 62 of the rear guiding slide 6. The guide bolts 4,5 are thus located precisely against the ends 31, 62 of the guiding slides 3, 6 remote from the

overlapping region 32, 61. During subsequent displacement of the motor vehicle seat from the useful position into the forwardly displaced position shown in Figure 2 the guide bolts 4, 5 do indeed move towards each other since the rear guide bolt 5 arrives at the front end 61 of the rear guiding slide 6 and the front guide bolt 4 arrives at the rear end 32 of the front guiding slide 3 but the two guiding slides 3, 6 move away from each other at the same time so that the facing ends 32, 61 of the guiding slides 3, 6 no longer overlap and the risk of collision between the guide bolts 4, 5 does not arise.

In any case in the event of the guiding slides 3, 6 overlapping the associated sliders 8, 9 must be designed so that there is no risk of the sliders 8, 9 colliding. For this the sliders 8, 9 can be configured accordingly in their facing end sections, for example in that one slider 8 is only provided with slide faces along its lower side in the vertical direction, and the other slider 9 is only provided with slide faces along its upper side in the vertical direction.